

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of the claims in the application:

Listing of Claims:

1. (previously presented) An electronic circuit equipment using a multilayer circuit board on which a semiconductor chip is mounted, comprising:
a thin film capacitor provided on said multilayer circuit board, wherein a first electrode of said thin film capacitor and a first wiring of said multilayer circuit board, are electrically connected to each other, a second electrode of said thin film capacitor and a second wiring of said multilayer circuit board being electrically connected to each other, and a thin film dielectric of said thin film capacitor is formed by being grown epitaxially with said first electrode as its base.

2. (previously presented) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein said multilayer circuit board includes a resin and a conductor, said thin film capacitor is buried in said resin, and at least one of electrical connections

between said wirings and said electrodes is established via a hole bored in said resin.

3. (previously presented) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein said first electrode and said first wiring have the same pattern, and are laminated.

4. (previously presented) An electronic circuit equipment using a multilayer circuit board on which a semiconductor chip is mounted, comprising:
a thin film capacitor provided on said multilayer circuit board, wherein a first electrode of said thin film capacitor and a first wiring of said multilayer circuit board, which wiring is formed of a metal different from a metal of said first electrode, are electrically connected to each other, a second electrode of said thin film capacitor and a second wiring of said multilayer circuit board being electrically connected to each other, and a thin film dielectric of said thin film capacitor is formed by being grown epitaxially with said first electrode as its base, wherein an area of said second electrode is narrower than an area of said thin film dielectric, and said second

electrode is located on an inner side of said thin film dielectric.

5. (canceled)

6. (currently amended) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein said first electrode is a metal selected from a group consisting of including Ru, Pt, and Pd.

7. (previously presented) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 6, wherein said thin film dielectric is formed of strontium titanate.

8. (currently amended) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein said first electrode has a first connection layer positioned on a plane of said first electrode opposite to said thin film dielectric and formed of a metal different from a conductor of said first electrode, said first connection layer being a metal selected from a group consisting of including Cr, Mo, and Ti.

9. (currently amended) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein said second electrode has a second connection layer positioned on a plane facing said thin film dielectric and formed of a metal different from a conductor of said second electrode, said second connection layer being a metal selected from a group consisting of including Cr, Mo, and Ti.

10. (previously presented) The electronic circuit equipment using said multilayer circuit board as claimed in Claim 1, wherein, one of said first electrode and said second electrode, which faces a conductor of a transmission line formed on said multilayer circuit board is set at a grounding potential.

11. (previously presented) A multi-layer electronic circuit board having an embedded thin film capacitor comprising

a first dielectric circuit board layer;
a first electrically conductive layer supported on
said first dielectric layer;

an electrode layer supported on said first electrically conductive layer, said electrode layer being a metal and having a composition different from that of said first electrically conductive layer;

an epitaxial dielectric layer supported on said electrode layer;

a metallic connection layer overlying said epitaxial dielectric layer and in contact therewith;

a second electrically conductive layer overlying and in contact with said metallic connection layer; and

a second circuit board dielectric layer covering said second electrically conductive layer.

12. (previously presented) The multi-layer electronic circuit board of claim 11, wherein said metal of said electrode layer is selected from the group consisting of Ru, Pt, and Pd.

13. (previously presented) The multi-layer electronic circuit board of claim 11, wherein said epitaxial dielectric layer is strontium titanate.

14. (currently amended) The multi-layer electronic circuit board of claim 11, wherein said metallic connection layer is selected formed from a metal selected from the group consisting of Cr, Mo, and Ti.

REMARKS

Applicants respectfully request favorable reconsideration of this application, as amended.

Claim 5 has been canceled and Claims 6, 8 and 9 have been amended to correct informalities according to the suggestions of the examiner. Accordingly, Claims 1-4 and 6-14 remain pending in the application. Applicants appreciate the indication of allowance of Claim 4.

Claims 11, 12, and 14 were rejected under 35 U.S.C. § 102(e) as being anticipated by Sunahara (U.S. Patent 6,153,290). Reconsideration of the rejection is respectfully requested.

Regarding Independent Claim 11, the Office contends that Sunahara discloses a first electrically conductive layer (14) and an electrode layer (23) supported on the first electrically conductive layer and having a composition different from that of said first electrically conductive layer. However, applicants respectfully point out that the disclosures of Sunahara are silent as to any difference between the composition of the "wiring conductor" 14 and the terminal electrode 23. Indeed, the language used by Sunahara to describe the possible compositions for the wiring conductor 14 (column 5,

lines 4-7) is identical with that used to describe the composition of the terminal electrode 23 (column 6, lines 19-25). There is no indication in this disclosure that the wiring conductor 14 and the terminal electrode 23 have different compositions.

The Office further identifies Sunahara's laminated ceramic layers 3-7 as an epitaxial dielectric layer and asserts that this epitaxial dielectric layer is supported on the electrode layer 23. However, inspection of Figures 1 and 3 clearly establishes that none of the layers 3-7 is supported on electrode layer 23. Instead, electrode layer 23 is inserted in an aperture in layer 7. Although this structural difference clearly distinguishes the claimed structure from that of Sunahara, Applicants additionally point out that Sunahara's laminated ceramic layers 3-7 are not epitaxial layers, but rather conventional ceramic layers prepared by laminating ceramic green sheets 3g-7g, along with ceramic green sheets 2g and 8g, and firing the laminated article to produce a multi-layered ceramic substrate 1.

It is also clear from Figures 1 that Sunahara's thick-film resistor 12 does not overlie conductive layer 17, as

asserted by the Office, but only connects conductor 17 to conductor 16 (column 7, lines 12-15).

In view of the extensive structural differences between the claimed multi-layer circuit board of Claim 11 and the circuit board disclosed in the Sunahara reference, a rejection of Claim 11 under 35 U.S.C. § 102(b) is inappropriate, and the Examiner is respectfully requested to withdraw it.

Furthermore, with respect to dependent Claim 14, the Office asserts that Sunahara discloses a circuit board wherein said metallic connection layer is selected from being a metal selected from a group including Cr, Mo, and Ti, referencing column 11, lines 10-24 of the reference (page 3, last paragraph of the Office Action). Applicants respectfully point out that the referenced passage from Sunahara does not mention metals such as Cr, Mo, and Ti. Furthermore, a review of column 11 as well as corresponding lines of other columns fails to locate relevant disclosure that would suggest a typographical error in the citation. The only places in the Sunahara reference that disclose a group of metals including Cr, Mo, and Ti are at column 4, lines 39-42; column 7, lines 64-67; and column 12 lines 32-36. However, these disclosures do not

t ach that the recited metals are used as conductors. Instead, these metals are used as constituents of a paste 50g, which is used as a filler between the sides of the embedded capacitor and/or inductor component. During firing, the metals induce an oxidation reaction accompanied by expansion (column 7, lines 59-61). The application of paste 50g and its function during firing is discussed extensively in Sunahara at column 7, line 59 - column 8, line 34; column 8, lines 51-63; column 9, line 57 - column 10, line 48; column 11, lines 31-46; and column 12, lines 32-47. Furthermore, the sidewall formed by the paste 50g after it is fired is an oxidized composition and extends between the terminal electrodes of the capacitor (10) and inductor components (11). Accordingly, the skilled practitioner would be taught both by the composition and the physical position of the sidewall that it cannot be made of a conductive material. If it were conductive it would short-circuit the terminal electrodes of the capacitor and/or inductor components. Consequently, whatever, the Office may have intended by the statement at page 4, last paragraph, it cannot refer to a disclosure of a claim element that could be found in the structure claimed in Claim 14.

In view of the patentability of Claim 11 and the further discussion of the patentability of Claim 14, withdrawal of the rejection of dependent Claims 12 and 14, is respectfully requested.

Claims 1-3 and 5-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lauffer, U.S. Patent 5,027,253, in view of Sunahara. Reconsideration of the rejection is respectfully requested.

The Office asserts that all elements of the claimed multi-layer circuit board, except the first wiring formed from a material different from a metal of the first electrode, are disclosed in the Lauffer reference. (Applicants assume, from the context, that the word "not" was inadvertently omitted from the last sentence on page 4 of the Office Action, and the sentence therefore should read, "Lauffer does not disclose ... etc.") The Office thus concedes that the primary reference, Lauffer, does not teach or suggest a first electrode of the thin film capacitor and a first wiring of the multilayer circuit board, which wiring is formed of a metal different from a metal of the first electrode, as recited in Independent Claim 1.

The secondary reference, Sunahara, does not remedy the deficiency of the primary reference. The Office contends that Sunahara shows a multilayer ceramic substrate comprising an internal wiring conductor (14) made of a metal different from a metal of an electrode (22, 23) of a capacitor (page 5, lines 1-4, of the Office Action). Applicants respectfully point out that Sunahara's disclosure makes no mention of a metal of a wiring conductor being different from a metal of a capacitor electrode.

At the first place referenced by the Examiner, Sunahara teaches that a wiring conductor preferably contains as a primary component at least one metal selected from a group of specified metals and alloys (column 5, lines 4-7). More specifically, at column 7, lines 19-34, Sunahara teaches that a wiring conductor such as wiring conductor 14 is formed by applying an electrically conductive paste to a ceramic green sheet 8g, wherein the electrically conductive paste contains as a primary component at least one species selected from a group of enumerated metals and alloys.

At the second place referenced by the Examiner (column 6, lines 20-25), Sunahara teaches that the terminal

electrodes (22, 23) are formed by employing an electrically conductive paste containing as a primary component at least one species selected from the group consisting of the same metals and alloys as recited for the wiring conductor 14. Thus, Sunahara teaches that the wiring conductor and the terminal electrodes can be made of the same material. There is no teaching or suggestion in Sunahara that the practitioner should make wiring conductor 14 and terminal electrodes 22, 23 of different metals.

The Office Action goes on to assert that it would have been obvious to have a metal of a capacitor different from a metal of a wiring conductor "to employ the electronic circuit equipment in order to provide a specific function of conductivity of the capacitor when built into the multilayer substrate" (page 5, lines 5-9, of the Office Action). To the extent that Applicants are able to understand the meaning of this statement, they remark that neither Sunahara nor Lauffer appears to contain any disclosure regarding a "specific function of conductivity of the capacitor when built into the multilayer substrate". In view of the absence of such disclosure, there is no motivation to combine the references. Consequently, Applicants respectfully submit that the Lauffer and

Sunahara references do not make obvious Applicants' electronic circuit equipment using a multilayer circuit board as claimed in Independent Claim 1. Accordingly, the Examiner is respectfully requested to withdraw the rejection of Claim 1 under 35 U.S.C. § 103(a).

From the foregoing discussion it is evident that Claim 1 and the claims dependent therefrom are patentable. Furthermore, however, with regard to certain of the dependent claims, the assertions made in the Office Action are not supported by the disclosures of the reference patents.

In particular, as to Claim 3, the assertions at page 5, lines 14-16, of the text of the Office Action, are not supported by the disclosures of the Lauffer reference. The Office asserts that Lauffer discloses a first electrode (identified, at page 4, line 9 of paragraph #5 of the Office Action, as Lauffer's reference numeral 121) and a first electrode (identified, at page 4, line 9 of paragraph #5 of the Office Action, as Lauffer's reference numeral 125), and states that the first electrode and first wiring are made of different materials. On the contrary, the portions of the Lauffer reference cited by the Office merely list a number of metals that can be used for these

structures, without any indication that they are made of different materials. In fact, Lauffer identifies a signal core 121 (with reference arrow lead line) which includes a first thin film copper wire 123 terminating in a first copper electrode 125 (column 11, lines 58-61). This disclosure establishes that the entire signal core structure is made of a single metal, not different metals as asserted in the Office Action. In view of this distinction, the rejection of Claim 5 cannot be maintained, and the Examiner is respectfully requested to withdraw it.

As to Claim 8, the Office asserts that Lauffer discloses a first electrode (125) having a first connection layer positioned on a plane of said first electrode opposite to said thin film dielectric and formed of a metal different from a conductor of said first electrode. The Office does not identify the first connection layer with a reference numeral. Applicants do not see such a connection layer in the relevant Figure 2 of the Lauffer reference.

As to Claim 9, the same considerations apply, *mutatis mutandis*, as discussed above with respect to Claim 8.

Claims 6-7, and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sunahara (U.S. Patent 6,153,290) or Lauffer (U.S. Patent 5,027,253)

in view of Summerfeldt et al. (U.S. Patent 6,319,542).

Reconsideration of the rejection is respectfully requested.

The deficiencies of the Sunahara and Lauffer references have been discussed extensively above, especially with respect to Independent Claim 1, from which Claims 6-7 depend, and Independent Claim 11, from which Claim 13 depends. Consequently, Claims 6-7 are patentable as dependent from patentable Independent Claim 1 and Claim 13 is patentable as dependent from patentable Independent Claim 13. The disclosure in Summerfelt merely recapitulates the known use of Ru, Pt and Pd as electrodes in thin film capacitors. The use of such metals as electrodes in the capacitors that are elements of the circuit boards disclosed in Sunahara and Lauffer does not produce an article that is obvious in view of the combined disclosures of the cited references. Accordingly, Claims 6-7, and 13 are not obvious over the disclosures of the cited references, and the Examiner is respectfully requested to withdraw the rejection.

This application is now believed to be in condition for allowance, and an early Notice of Allowance is respectfully requested.

The Commissioner is hereby authorized to charge to Deposit Account No. 50-1165 any fees under 37 C.F.R. § 112 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this paper and has not been requested separately, such extension is hereby requested.

Respectfully requested,

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